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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification [4]: E05B 17/22	A1	(11) International Publication Number: WO 85/ 03971
		(43) International Publication Date: 12 September 1985 (12.09.85)

(21) International Application Number: PCT/GB85/00083

(22) International Filing Date: 28 February 1985 (28.02.85)

(31) Priority Application Number: 8405341

(32) Priority Date: 29 February 1984 (29.02.84)

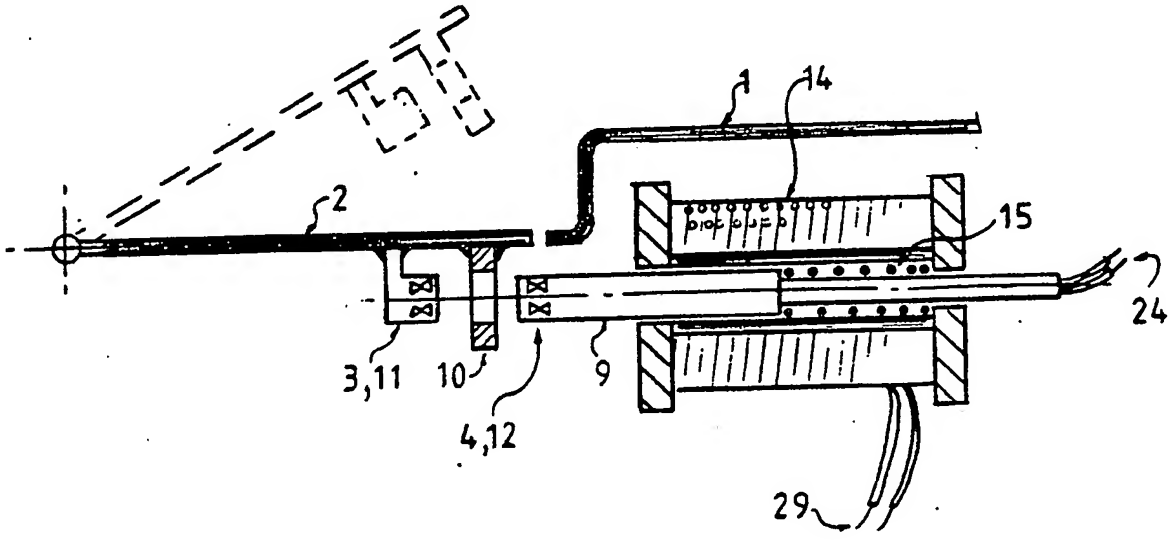
(33) Priority Country: GB

(71)(72) Applicant and Inventor: SMITH, Donald, Bebbington [GB/GB]; 68 Numa Court, Justin Close, Brentford, Middlesex TW8 8QF (GB).

(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.

Published
With international search report.

(54) Title: CHECKING DEVICES FOR FASTENERS



(57) Abstract

A fastener checking device includes a fastener (9), an engaging member (10) with which the fastener engages, coding means (11) and detecting means (12). The coding means and detecting means are arranged each on one of the fastener and the engaging member, the detecting means being so arranged as to detect a particular relative position between it and the coding means, and thereupon to enable a signal to be generated.

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CHECKING DEVICES FOR FASTENERS

Technical field - This invention relates to checking devices for fasteners and will be described for example with reference to interlocking devices for doors, covers, lids, etc, which have to be held shut on pressure vessels, electrical equipment, machinery, etc, or in buildings, and where an interlock is also desired with a power or control system, with process or service valves, etc, or with a security or energy conservation system. It may also be applied in any other situation where closure of a door, etc is associated with a control operation.

Background art - It is known to have position sensing devices for doors, covers, etc, which check that they are roughly in place. Often it is advantageous also to know that they are latched and will not leak, or will not move out of place due to vibration or other disturbance. It is difficult to check that a latch is home and still to use an electromechanical switch in the positive mode where it is forced into the off position as the latch moves away or before it does so.

New position sensing devices are known which though not fail safe, actually fail to danger less than electromechanical devices. These are generally semi-conductor devices with no moving parts, and which do not rely on a direct contact or a movement to cause them to switch, but which switch in the presence of a specific target device, e.g. a resonant circuit or an array of magnets. Other devices are known which are contact devices but where no mechanical movement is required to operate them - the contact may be electrical and may detect leakage or a significant current flow.

Fastening technology includes catches, latches, bolts, clips and a variety of other releasable fastenings, spring, manually, or power operated.

Object - The object of the present invention is to combine position sensing devices with no external moving parts with latching and fastening mechanisms for doors in such a way

that the door position is checked, and also the fact that the fastener is fully home, or at least is engaging is checked. The invention may use similar or other sensing devices in association with keys to provide secure means of releasing the fastenings, and also in association with fastener keepers designed to prevent movement or release of the fastener.

Drawings - Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a door with a solenoid operated deadbolt, in which sensors are mounted in the bolt and a target device on the door.

Figure 2 shows a door with a pneumatic deadbolt, in which sensors are mounted on the door framework, and target devices on both the door and and the deadbolt.

Figure 3 shows a door with a solenoid operated deadbolt, with a target device on the door, transmission means through the bolt, and sensors on the fixed framework.

Figure 4 shows a modification of the embodiment in figure 2, wherein a handle on one side of the door can be used to release the solenoid bolt, and on the other side a key element actuates further sensors to actuate the solenoid for the release of the door.

Figure 5 shows a conventional door latch modified to have target devices in the bolt head, and a recess into which a solenoid bolt enters to prevent unlatching, the solenoid bolt head also carrying target devices. As in the embodiment of figure 4, a key element is available for release of the solenoid bolt from the outside.

Figure 6 shows an arrangement whereby a solenoid bolt mounted in a door jamb may be released to engage the door as a target device meets a first sensor and a second solenoid bolt engages the first when target devices on the first bolt register it is home. A key element affecting another part of the sensor is used for release.

Figure 7 shows a modification of figure 6 where the bolt

has transmission means as in figure 3, and is releasable as in figure 4 by a handle on one side of the door only.

Figure 8 shows a typical washing machine door latch, where the door mounted hook carries a target device, as also does the catch plate which engages it, and the delay bolt which engages that. All target devices cooperate with fixed sensors.

Figure 9 shows a variation in which the catch is released not by a handle on the door, but by a press button on the machine facia.

Figure 10 shows a cupboard catch where a sensor is mounted in the fixed part, and a target device for it to detect is on the door mounted part.

Figure 11 shows a captively mounted screw the tip of which is adapted to be a sensor target.

Figure 12 shows a screw in which are mounted several target devices.

Figure 13 shows a system similar to that in figure 1, but with sensor end target reversed.

Figure 14 shows a system fitted to two parts of an enclosure.

Figure 15 shows a system for fastening one machine part to another.

Figure 16 shows a conventional sliding bolt.

Figure 17 shows a conventional slam bolt, with sliding handle.

Figure 18 shows a form of lever handle with a catch designed for caulking or compressing a seal.

Figure 19 shows three-dimensional arrays of target and sensor elements, in a slide by arrangement for use on a linear bolt mechanism.

Figure 20 shows an arrangement of an opto coupler, a manget/Hall effect coupler and an eddy current killed oscillator proximity switch providing separate channels in a sensing system, for a fastener device.

Figure 21 shows a door latching hook is provided with a target in the hook, which mates with a sensor mounted on a latch keeper.

Figure 22 shows a similar mechanism with a door release button.

The embodiments variously include any or all of the following.

An enclosure, room corridor, etc 1 with an opening and door, lid, cover, guard, etc 2 for closing it, a door-mounted target element(s) 3 and a sensor or sensors 4 to cooperate with it or them.

A keyhole, card slot, etc 5 and key or card, etc 6 with integral target element(s) or bits 7 and a sensor or sensors 8 to cooperate with it or them.

A fastener (usually releasable) such as a bolt, catch, latch, screwed bolt, etc 9 engaging in a counterpart engaging member 10 such as a housing with a target 11 on the fastener part and a sensor 12 on the engaging member; manual operating means such as a handle or knob 13 and/or powered operating means such as a solenoid or pneumatic or hydraulic cylinder 14 and a return spring 15.

A fastener keeper 18 with a target 19 and sensor 20, the keeper being manually operable by a handle 21 or powered by means 22 such as those used to operate the fastener, with a return spring 31.

A power reservoir such as a battery, capacitor, hydraulic or penumatic accumulator, spring, flywheel or weight system for operating or releasing any powered fastener, fastener keeper, door or other element in the event of external power failure.

Connections 16, to the door sensor 4; connections 17 to the door target; connections 24 to the fastener sensor 12; connections 25 to the fastener target 11; connections 26 to the fastener keeper sensor 20; connections 27 to the fastener keeper target 19; connections 28 to the key sensor 8; connections 29 to a powered fastener operator 14; connections 30 to a powered fastener keeper operator 22.

Internal connections 32 within the fastener device, or 33 within the fastener keeper.

Intermediate linkages etc 34 for releasing or operating a fastener, or for retaining it.

In each of the following descriptions, the numbers given earlier are given to parts with similar functions. The possible types of device which may constitute targets, sensors etc, are discussed later.

The embodiment in figure 1 includes a door 2 in an enclosure. On the door is mounted a target device 3.

A solenoid 14 is mounted on the fixed part of the enclosure, the bolt 9 of which engages with a bolt hole 10 on the door when the solenoid is released with the door closed, so that the sensing elements 12 which are connected to the equipment control system by flying leads 24 come into close proximity with the target elements 3, 11 under the action of the spring 15.

The solenoid is controlled by electrical switches in any known way. The bolt head may be of non-magnetic material where the solenoid's own residual field might affect the sensors.

The embodiment in figure 2 includes a door 2 in an enclosure 1, with a target device 3 mounted on the door. As the door is closed, the target device is sensed by the fixed sensor device 4,12, the signal from which initiates the release of the pneumatic bolt 9 through wires or appropriate connections 16, 24, a control system, and pneumatic pipes 29. On release of the bolt, further target devices 11 mounted in it come into proximity with the sensor device, and this now gives a different output signal permitting the process, etc to start, the door now being held as in the previous embodiment.

In the embodiment in figure 3, the arrangement is effectively that of figure 1, save that the need for flying leads is obviated by the use of appropriate signal transmission paths 11, 32 in the bolt, linking the sensor 4, 12, and target 3, 11. Such transmission paths might be optic fibres in the case of an optoelectronic system, for example.

In the embodiment of figure 4, the system is adapted to include sensing not only of door 2 and fastener 9 position, but also the insertion of a correct keying card 6 or other known device, which provides one method of energising the

the solenoid 14 for fastener withdrawal. A door handle 13 is provided on the other side of the door which acts to push the solenoid bolt 9 back out of engagement with the door recess 10. The operation of the solenoid bolt on closure of the door is otherwise as in the embodiment of figure 2, but in the event of power loss, it is so shaped as to act as a slam latch under the action of spring 15.

In the embodiment of figure 5, an ordinary latch 9 and latch handle 13 are adapted to be sensed on engagement of the latch bolt in the door stile, a solenoid bolt 18 being released to engage in the latch bolt, deadlocking it. Each of the latch bolt and solenoid bolt are sensed, and in addition a key 6 is used to release the solenoid bolt. It may also be used to de-energise the bolt, depending on the control circuit logic, and on whether it is desired to have automatic locking, or locking on demand, on closure of the door.

(This option applies also to the embodiemnt of figure 4, and to subsequent options involving a key element - and if desired, an arrangement to switch from one option to the other may be included in the control circuits, for example as a central security measure.)

In the embodiment of figure 6, a door position sensing arrangement 3, 4 is provided as in figure 2 and figure 4, but the bolting arrangement consists of a solenoid withdrawable bolt 9 in the door jamb, also pushable back to release the door as in figure 4, but deadlockable as in figure 5, there being a door handle 13 on each side of the door. The key element 6 energises the second solenoid 22, enabling the door handles to be used to release the door.

In the embodiment of figure 7, the system of figure 4 is simplified by reducing the number of targets and sensors in the same way as in figure 3, using transmission paths 11, 32 in the bolt 9. The transmission paths as illustrated are electrical wires, in which a coding diode is connected.

In the embodiment of figure 8, the hook 9 displaces the catch plate 34 as it enters the hole 10 in the machine casing 1, the hook subsequently engaging on the edge of said hole, and the catch plate springing back into place under the action

of the spring 15. In this condition, the hook may be released by a pull on the handle 13 or, if the machine is to be started, the bolt device 18, which may be a solenoid device or electrothermal for example, will engage to prevent the catch plate sliding and the hook being released. If the hook and catch plate are not sensed as being in the correct positions by their respective sensing devices, the bolt 18 does not engage, and its sensor 20 is therefore not triggered to allow the machine to start.

The embodiment of figure 9 is different only in that the method of releasing the hook is dependent on a press button 13 on the facia of the machine, and once it is released, the door 2 springs open by virtue of the seal.

In the embodiment of figure 10, the sensing and target elements are embedded respectively in the frame mounted and door mounted parts of the catch.

In the embodiment of figure 11, the target element 3, 11 is contained in the tip of a captive set screw 9, and is sensed by a sensor 4, 12 at the bottom of the screw recess 10.

In the embodiment of figure 12, targets 11 are set into a bolt or setscrew 9 so that only one gives a correct 'home' signal, the other two (a) indicating as the fastener starts to slacken and (b) ensuring the home signal is not given when the fastener is loose by one complete turn.

In the embodiment of figure 13, the arrangement is as in figure 1 except that the target 11 is mounted on the bolt 9 and the sensor on the door 2/housing 10.

In the embodiment of figure 14, the door 2 and enclosure 1 are equal halves of a total enclosure box.

In the embodiment of figure 15, a machine part 2 completes an enclosure 1 formed by another machine part.

In the embodiment of figure 16, an ordinary surface-mounted sliding bolt 9 engages with a housing 10 in a door jamb, the targets 11 and sensors 12 meeting head on.

In the embodiment of figure 17, a slam latch bolt 9 engages with a housing 10, being withdrawable against spring 15 by handle 13 (which could obviously be replaced by a

normal rotary door handle with the usual lost motion arrangement.)

In the embodiment of figure 18, a lever handle 13 without lost motion is provided to do up a caulking or sealing type of latch 9.

In figure 19, details are shown of part of an embodiment involving a spatial array of target and sensor elements for use in a sliding approach mode.

In figure 20, details of a possible group of sensor and target devices are shown, including resonant circuit driven optocoupler 35 Hall effect device 36 and magnet 37 or shunt 38 and eddy current killed oscillator devices 39.

In figure 21, the embodiment shown incorporates a single target sensor 4, 12, 20 so arranged that door, fastener and fastener check must all be in position before the sensor can operate.

In these various embodiments, varying arrangements of each element with respect to others are given as examples. It will be readily seen that where, say, the embodiments figures 1 and 2 differ in a particular way, a particular feature in one of them only matches the embodiment of figure 3, and that last mentioned embodiment can be altered to match the other of 1 and 2. In this way, innumerable variations can be generated to suit particular purposes.

It will also be appreciated that variations can be generated by application of target devices and position sensors to any known fastening arrangement e.g. in lieu of mechanically operated microswitches or other devices which are similarly packaged, and which have a non-positive operation in one direction.

In the embodiment of figure 21, a hook latch 9 is closable against spring 31 pressure on the latch keeper 18. As the hook engages to fasten the door 2, the keeper springs back to retain it, the sensor 12 and target 11 then cooperating. The keeper is withdrawable by solenoid 22 action to allow the latch to be released manually by handle 13.

In the embodiments of figure 22, 23, solenoid actuation of the latch keeper 18 is replaced by electrothermal strip 22

action, the strip springing back to allow the hook to latch, if in the rest position. A latch position sensor 12 is optional, latch position being detectable by the keeper sensor.

Target 3 and sensor 4 may be reversed with respect to door and enclosure, though usually the connection of leads, etc will make this less convenient. (Compare figures 1 and 13.)

Door 2 and enclosure 1 may be effectively similar parts of a total enclosure (figure 14).

Targets and sensors may be mounted on two doors which between them complete an enclosure. They may be mounted on two parts of a machine or piece of equipment to ensure they are together. (figure 15).

Target and sensor may each contain target and sensing parts, instead of each being exclusively one or the other. (figure 14).

Targets may be permanent, unpowered devices; devices which require power from a connected suppy; devices which require power from the sensor. (figure 20).

The sensor(s) 4, 8, 12 may be combined to consist of a single device, or two, three or more physically distinct devices. (Compare figures 8 and 9).

While door sensors on their own are well known, any one or a combination of two, three or four of the elements door, fastener, key fastener keeper may be sensed by the same system.

The sensing system may involve electromechanical, pneumatic, hydraulic, or other moving-element sensors in some parts in addition to the non-moving sensors.

Manual and automatic means of operating doors, fasteners, fastener keepers may be provided, in some cases manual operation being available as an alternative to automatic, or one being operable from each side of the door. (figure 4).

The fastener may be door mounted, engaging in a counter-part piece of the enclosure, or enclosure mounted, engaging in the door. (figure 4, 5).

The fastener may be used to hold together parts of

machinery, equipment, pipework, etc. (figure 15).

The fastener keeper may be mounted with the fastener (e.g. both on the door) or on the other enclosing element (i.e. one on the door, one on the enclosure.)

The fastener, key, and fastener keeper may each be operable from one or both sides of the door. (figure 16, 17).

Manual and automatic elements (fasteners, doors, fastener keepers) may be operated one way and spring returned, or manually operated, automatically returned, or operated manually or automatically in both directions.

Any automatic device may operate in response to a signal, which may be manually initiated (e.g. for security purposes) automatically initiated for similar reasons by other sensors or by hazard sensors or time delays.

Operation of automatic devices including doors, fasteners, fastener keepers may be mechanical, electrothermal, electromagnetic, pneumatic, hydraulic, or by other known means.

More than one fastener may be fixed on one door. These may be different in type, e.g. one spring actuated manually returned, the other manually moved both ways.

Signals may be transmitted to and from sensors and targets along electrical wires or optical fibres, by electromagnetic radiation of any wavelength, or by magnetic, electrical or other fields.

Any manually operated fastener or fastener keeper may be normally handle, tool or key operated in either direction. (figure 17).

Where a single element serves a dual function - e.g. door sensor and fastener sensor, it is dual numbered.

Handles may have lost motion as in the slam latch arrangement on ordinary household doors, or may be positively operated in both directions, as in the caulking arrangements used to fasten sealed enclosures (figure 18).

Target 11 and sensor 12 may be reversed with respect to fastener 9 and counterpart housing 10 (see figures 1 and 2). A similar arrangement may be made in respect of the fastener keeper 18, target 10 sensor 20 and housing.

Targets and sensors may be arranged to approach one another

head on, or in a slide by mode. (Compare figures 1 and 2).

Target and sensor devices include any known system of presence or position sensing.

Targets may be coded spatially in one, two or three dimensions; i.e. their elements may be arranged along a line, on a plane surface, or in any spatial array. Different elements may be used to provide signals for different channels of a multi-channel system. (figure 19).

Target elements may also be coded temporally, in the sense that they may be tuned to receive and respond to a particular sequence or signals (or a particular frequency) or they may receive any signal and recode it in a particular way, or they may emit a particular code or frequency.

Targets may be further coded by the use of differing types of element and signal medium, e.g. optical (visual range), infra red, magnetic devices together. This method is known to be advantageous to reliability in multichannel systems because of the reduction in common-cause failures. (figure 20).

Further coding advantages can be gained when the targets elements are arranged to slide by their various sensor elements, when more than one of either operates in the same medium. The sequence of signals produced, in addition to the final position signal, can be used to confirm that the correct target or which one of several possible targets has been presented. The position in the output sequence may be used to measure the position of the coded element if this is important. (figure 19).

Coding in electrical contact systems can be achieved by using diodes suitably placed in targets or intermediate wiring, in association with a system of slugged relays which is well known (see figure 7). Coding in optical systems may be arranged similarly by use of filters.

It will be readily appreciated that any catch, latch, bolt, or fastening device generally can have a target device mounted in it, particularly where the target is simply a small magnet. Correspondingly, sensing devices can be mounted to cooperate with the fastening device either in its

fully home position or as it approaches that position.

Security, safety, reliability of the arrangement can be improved by the use of increasing numbers of target devices in particular relative positions and orientations and by the use of a variety of well known circuit features, such as redundancy, monitoring, voting logic, etc.

Logic circuits may be integral with the sensing devices, or may be remote from them, improving security. Local amplification may be provided to reduce the risk of noise affecting the output signals.

Almost any known position sensing device not requiring an external mechanical movement may be used, but usually the devices concerned will be semi-conductor devices of small size. They may be magneto-resistive, Hall effect, opto-electronic, photoelectric, inductive or capacitative or tuned circuit proximity switches, for example - utilising any medium or field which can transmit a logic signal. They may rely on contact - electrical or pressure - or not. They may contain internal moving parts, or not, as in reed switches.

The logic, signal conditioning, amplification, etc circuits for the devices described are familiar to anyone versed in the use of the devices, and are therefore not indicated here.

It will be readily appreciated that with certain types of device, the definition of their switching point may be influenced by their orientation with respect to their direction of movement; e.g. Hall effect devices switch more rapidly when passed across the face of an operating magnet than when simply brought to it face on. The effect is further enhanced by the use of two adjacent magnets with opposite poles adjacent. Such effects can be utilised to good effect in latch detection systems in accordance with the invention. Similarly, sensitive detection of position can be achieved using the difference signal between two adjacent devices, possibly utilising a bridge circuit.

Security of latch checking devices in accordance with the invention is improved where the 'slide by' orientation is

used with more than one sensing device, as simple logic circuits can be used to check the signals given by the target devices on their way past to their final position. With suitable time limitations built into the sensor circuitry, one-by-one defeat of the sensors can be prevented. This feature is known in Hall effect key/lock devices.

It will be noted that the invention embodies keys and locks; these may be regarded as discrete, portable coded elements and code sensors. (The output of the code sensors may be a mechanical, electrical or other signal.) Coded cards and card readers may also be seen as examples of this concept.

The invention also embodies coded elements on doors and associated code sensors (captive keys may be regarded as part of this concept). Further, it embodies coded elements on fasteners, and associated code sensors, and also coded elements on fastener keepers, and associated code sensors.

The complexity of the code used on each element can be varied according to the importance of differentiating it from attempts to interfere (and according to how likely these are) together with the need for reliability, including reliable discrimination from background noise (in the most general sense).

The type of coding used may be varied for similar reasons e.g. magnetic coding may need to be avoided where magnetic particles may contaminate the system.

Where there is no great need for security or reliability, devices which are hardly coded at all may be used; and where the need is even less, a fastener or other device which is automatic may be relied on to operate without the subsequent detection of its movement. This can be exemplified by reference to any of the figures, by removal of particular target/sensor pairs.

Any known code-reading method can be used, whether it relies on a reflected signal, a signal transmitted through an element, or any other known means. Examples of card-reading and disc reading systems using laser technology are known, and these can be used where a part of the card (e.g.

containing a hologram) is mounted on a door, latch, latch keeper, etc as the target, and the reader is the sensor. Similarly other code-reading methods may be used whether normally applied to card codes or to the reading of codes on such items as magnetic discs, magnetic tapes, laser discs etc, and whether or not the method involves relative motion between the coded information carrier and the sensor. In this last case, it will normally be easier for the sensor to scan, rather than for the appropriate element of the fastener to move.

It will be further appreciated that any part recognition system capable of being adapted to recognise a door, fastener fastener detainer, key or other specific object, will be capable of performing the same role. Reliability and security will depend on the ability to distinguish one object from another repeatably, and this will in turn depend on that object having suitable recognition markings or codes (target devices, in the terminology used so far).

Of the elements key/card, door, fastener, fastener keeper, the ones normally in most need of secure and reliable coding are those which come away from the mating part which carries its sensor and where the sensor is most accessible. Thus the fastener keeper is least likely to need high security coding.

Application - It will be appreciated that devices in accordance with the invention have widespread application to protective enclosures, and to doors in buildings generally, where a control operation is associated with the door for security, safety or other reasons particularly where micro-processor control is involved.

CLAIMS

1. A fastener checking device including a fastener 9, an engaging member 10 for the fastener, coding means 11, and detecting means 12, each of the coding means and the detecting means being arranged on one of the fastener and the engaging member, the detecting means being arranged to detect a particular relative position between it and the coding means and thereupon to enable a signal to be generated.

2. A device as claimed in claim 1, including a fastener keeper 18 engageable between the fastener 9 and the engaging member 10 to lock them against relative motion.

3. A device as claimed in claim 2, wherein coding means 19 and detecting means 20 are applied one each to the fastener keeper and to another part, the coding means and detecting means being so arranged as to detect a particular relative position between the fastener keeper and that other part.

4. A device as claimed in claims 1, 2 or 3, including a key hole or card slot 5 and key or card 6; with integral bits or coding means 7 and detecting means 8 arranged so as to detect a relative position of the key hole or card slot 5 and key or card 6, enabling a signal to be sent permitting the fastener 9 or fastener keeper 18 to be released.

5. A device as claimed in any of claims 1 to 4 wherein any of the coding means consists of an arrangement of magnetic poles and magnetic shunts, and any of the detecting means consists of an arrangement of Hall effect devices.

6. A method of operating a fastener checking device, including the step of operating the fastener to bring it to a position where a coding means 11 and sensing means 12 are in particular relative positions, such that the sensing means enables a signal to be generated.

7. A method as claimed in claim 6 including the step of operating a fastener keeper 18 such that the operation of the fastener is prevented.

8. A method as claimed in claim 7 wherein the step of operating the fastener keeper moves further coding means to a position where sensing means enable a signal to be generated.

FIG. 1

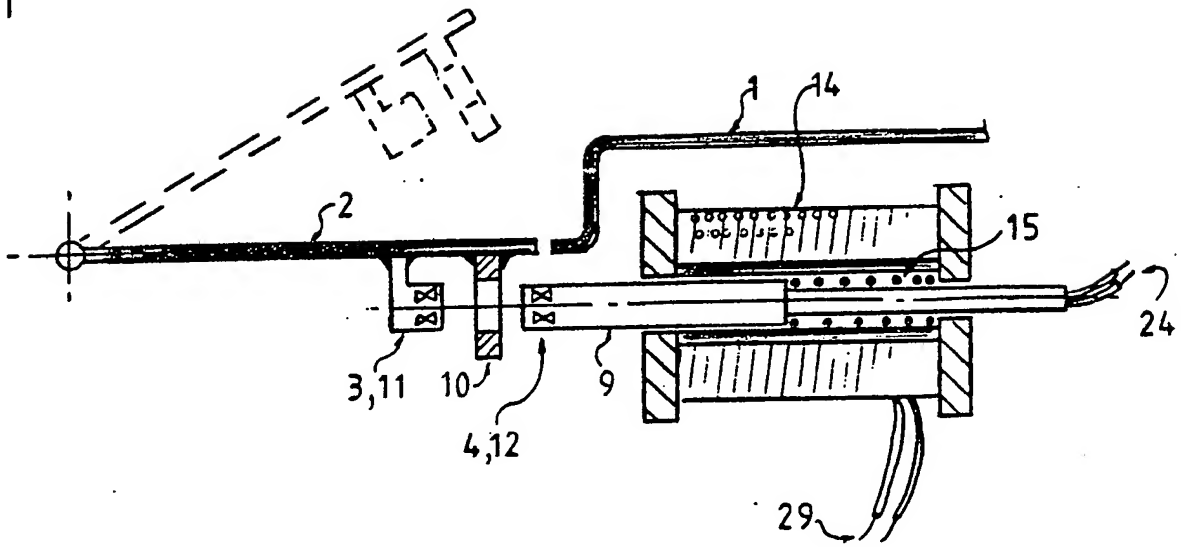

FIG. 2

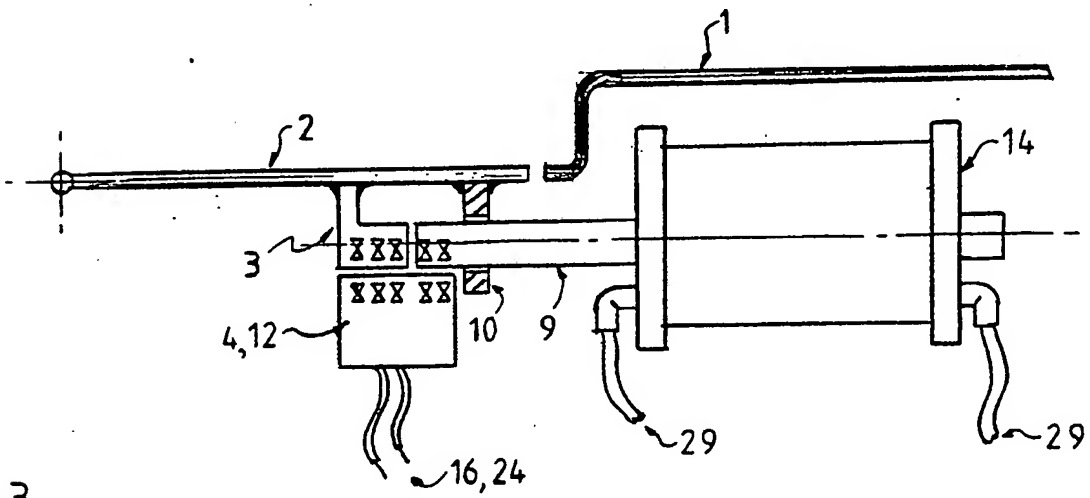

FIG. 3

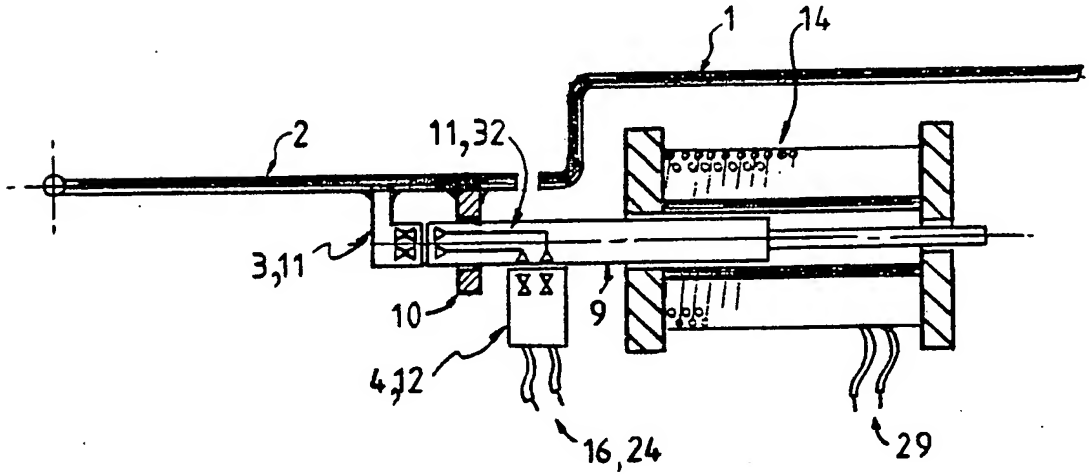

FIG. 4

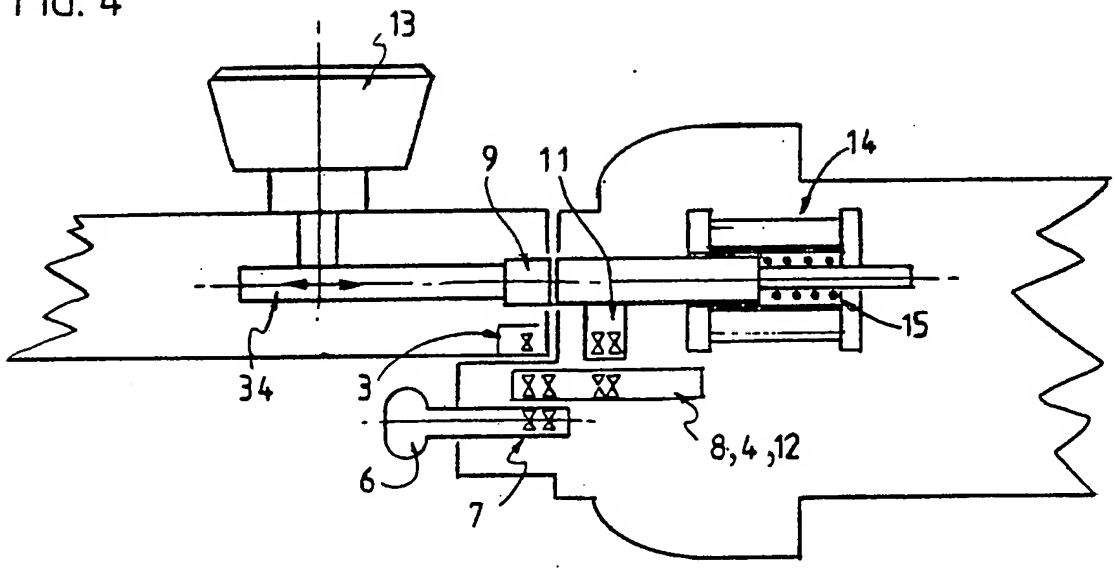

FIG. 5

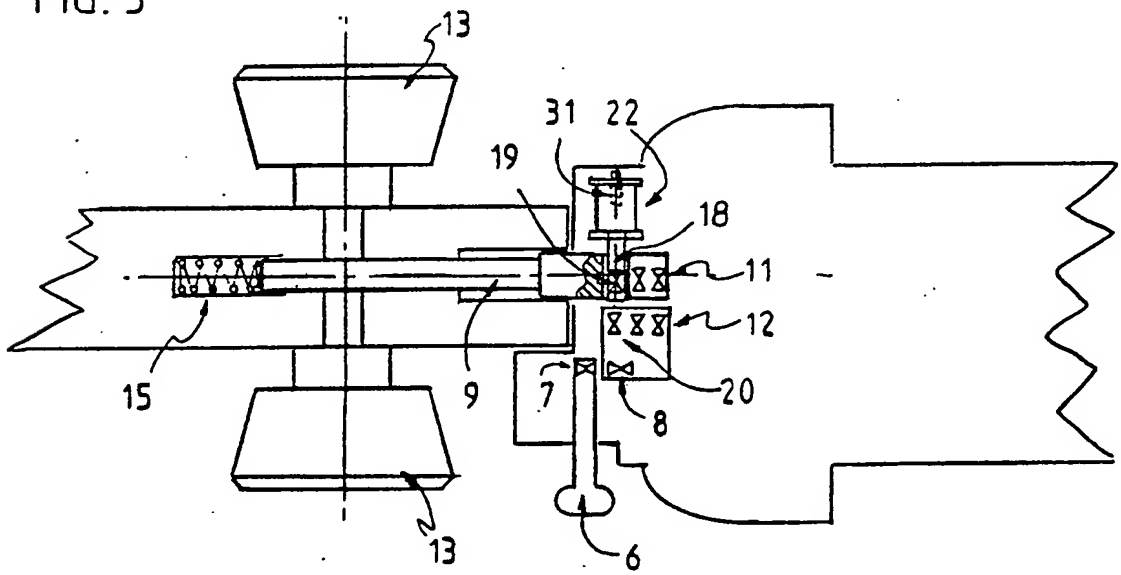

FIG. 6

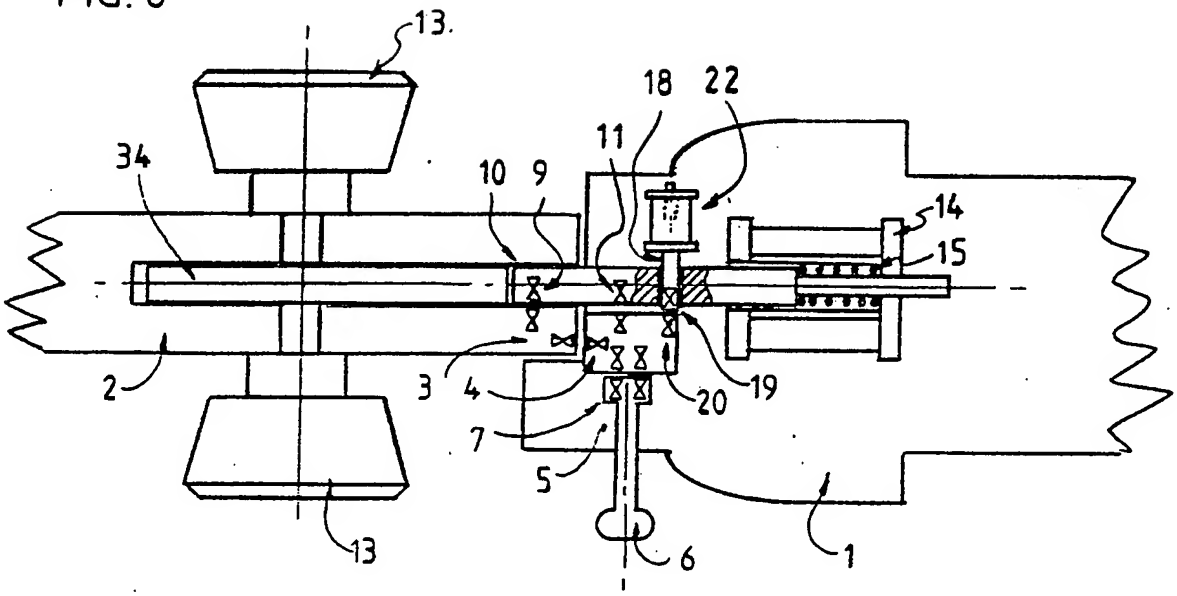
13
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FIG. 7

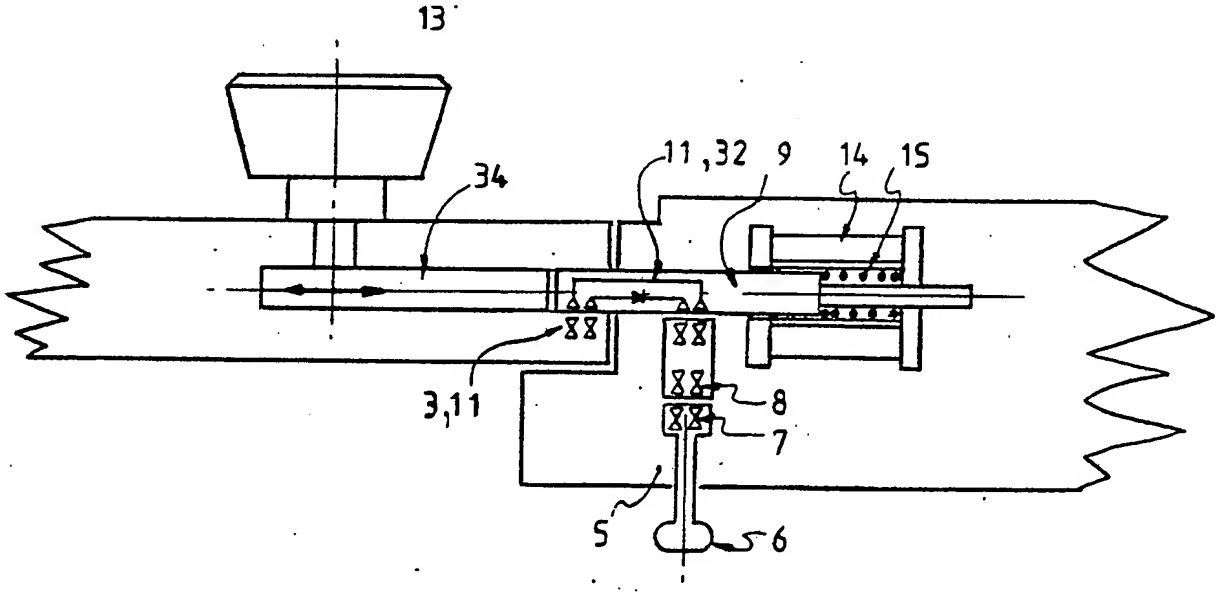
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FIG. 8

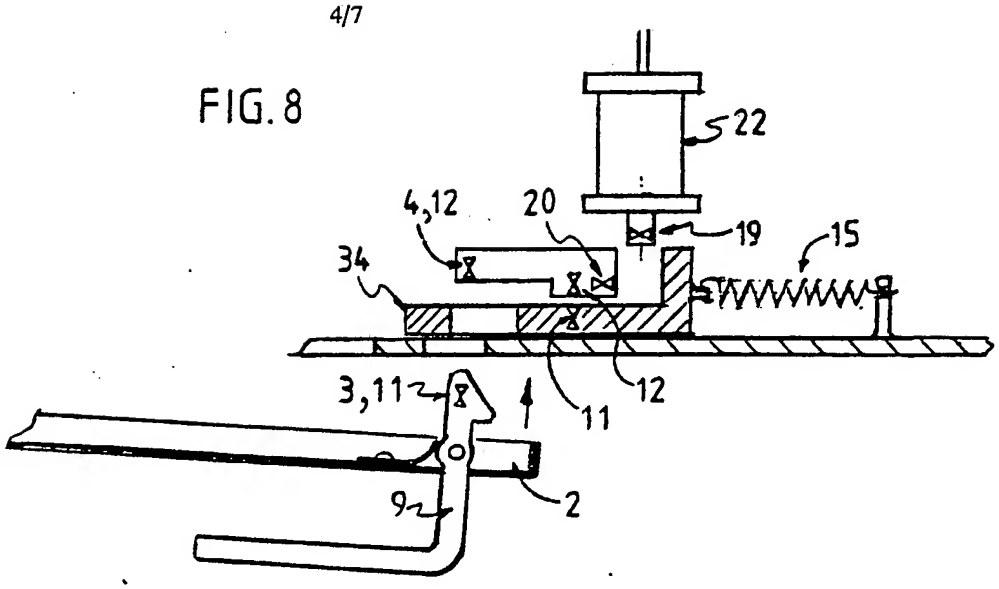


FIG. 9

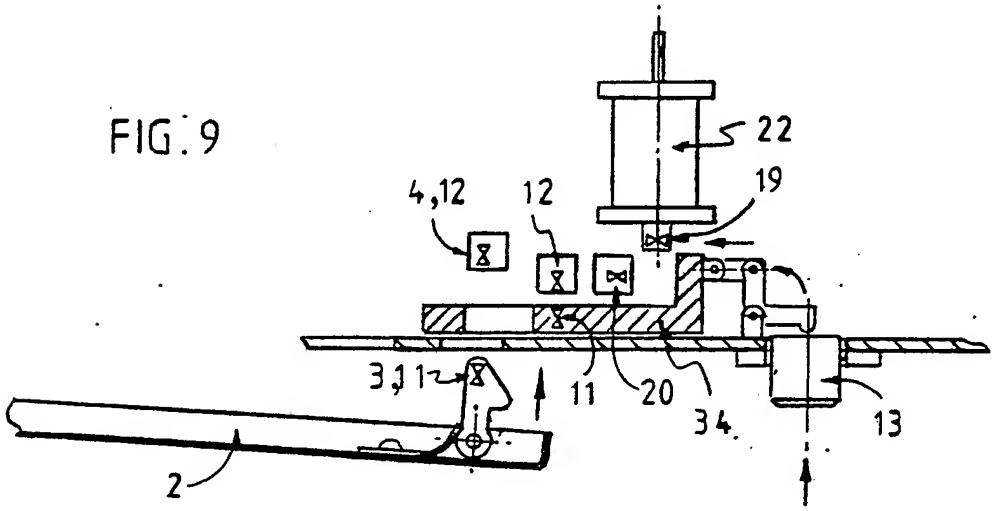


FIG. 10

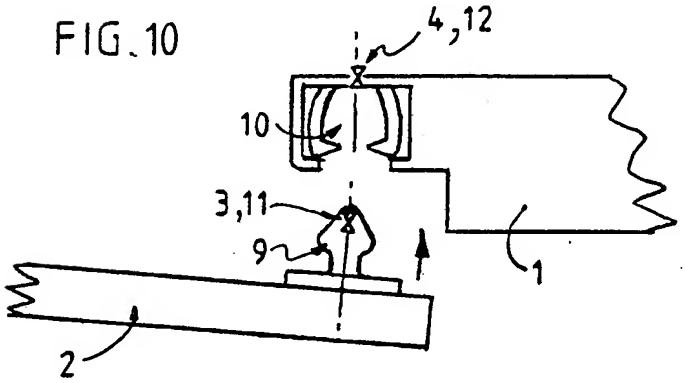


FIG. 11

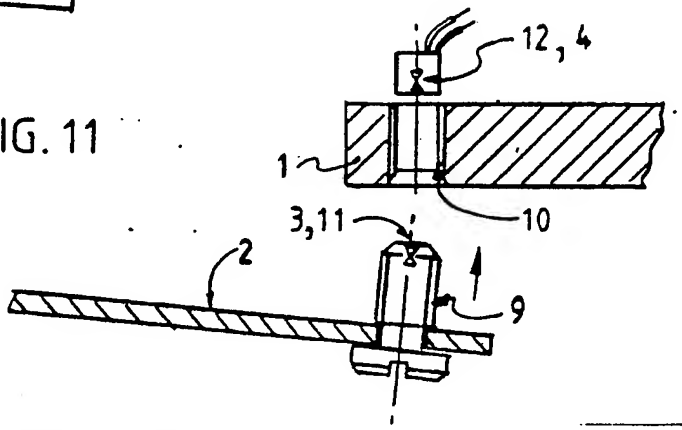


FIG. 12

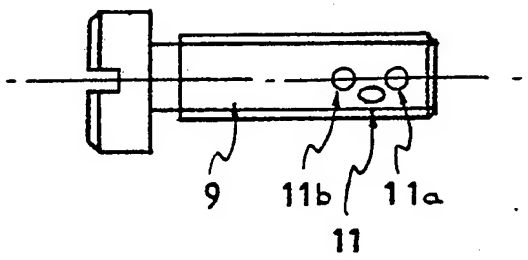


FIG. 13

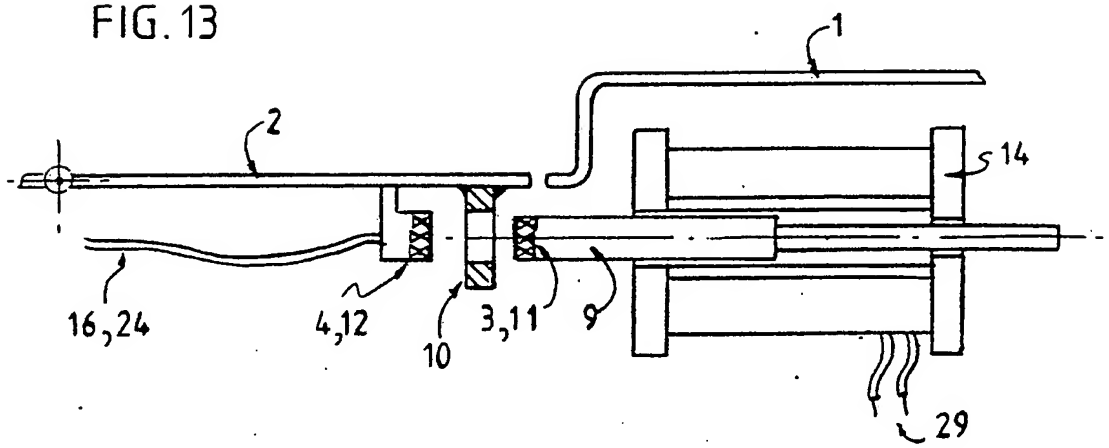


FIG. 14

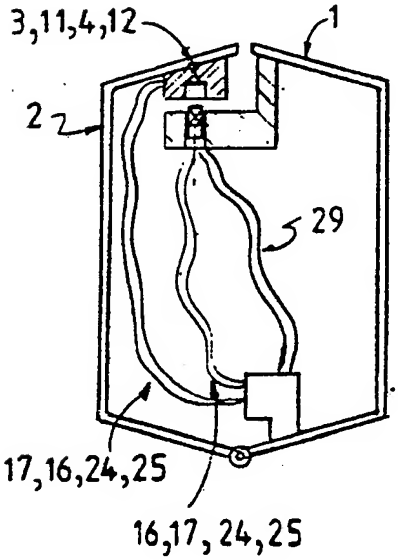


FIG. 15

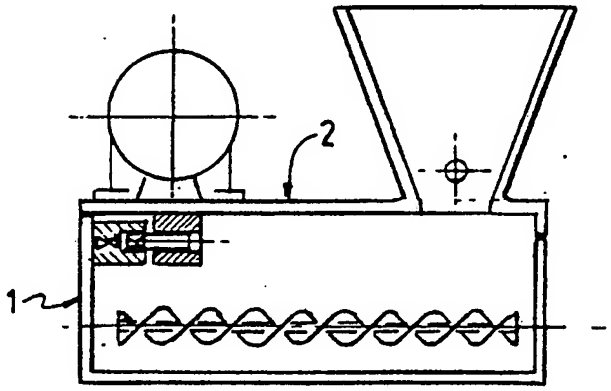


FIG. 16

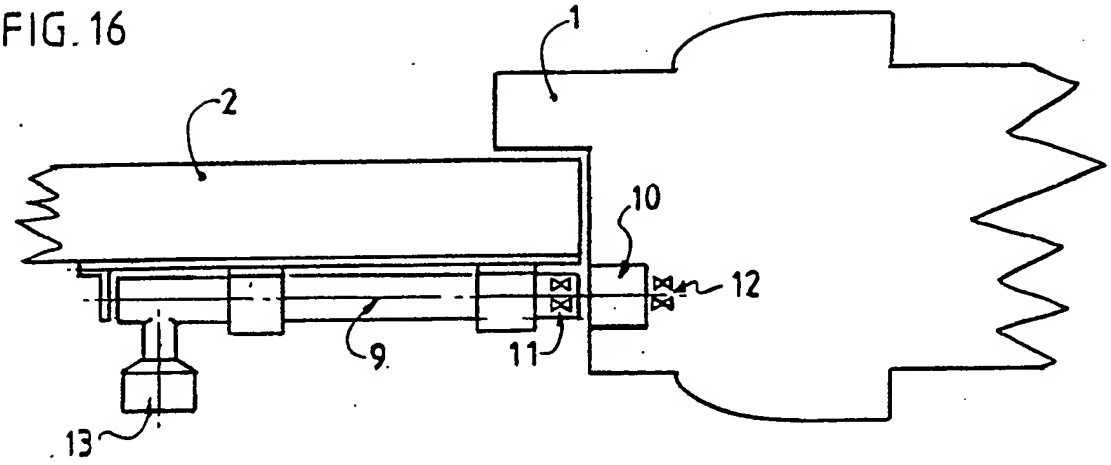


FIG. 17

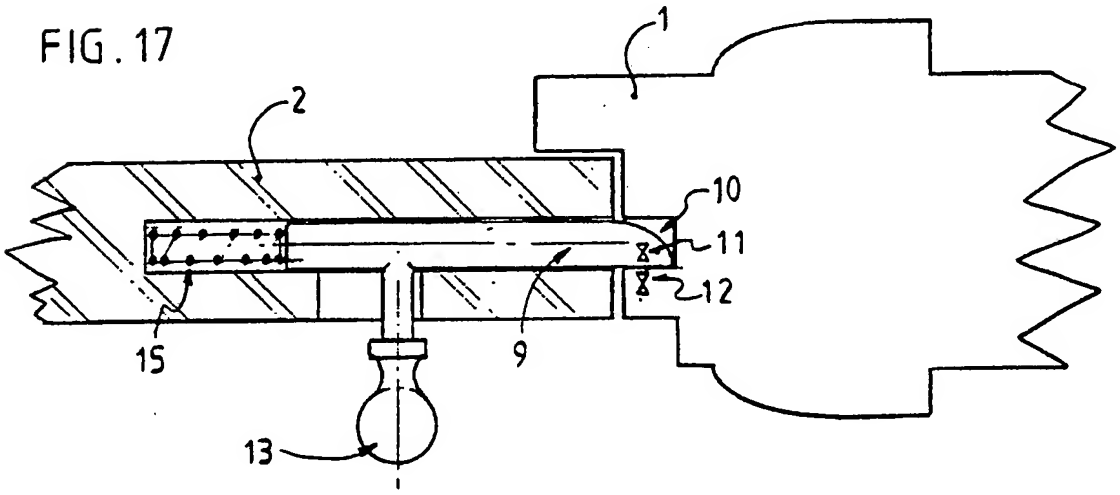


FIG. 18

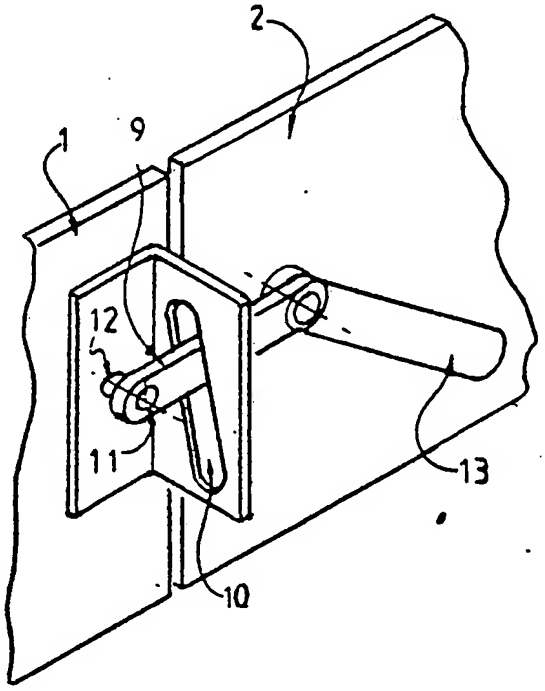


FIG. 19

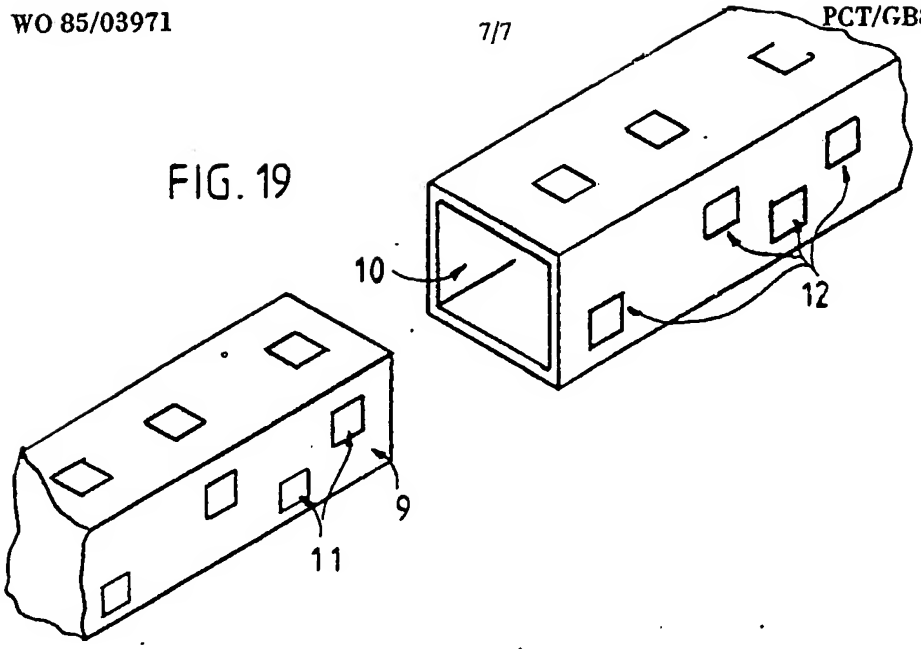


FIG. 20

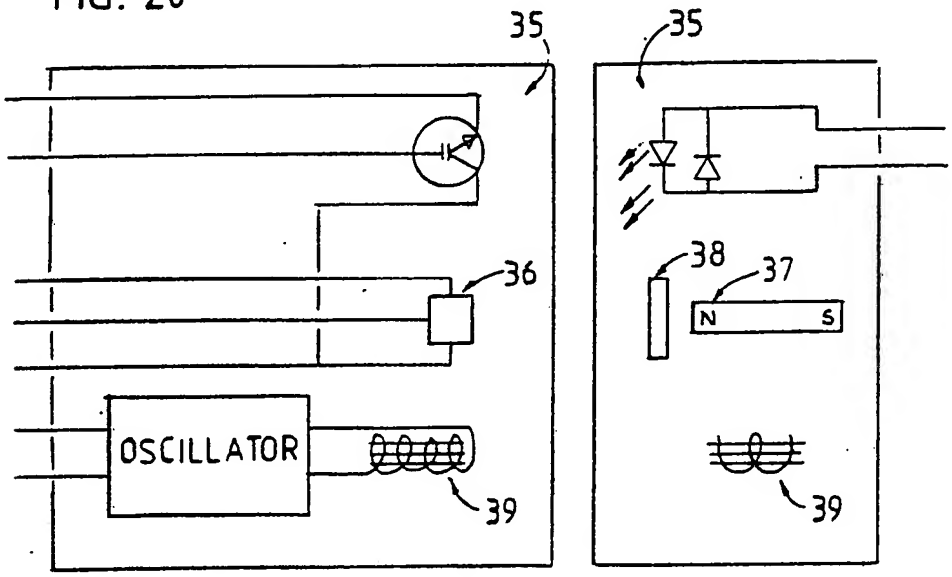


FIG. 21

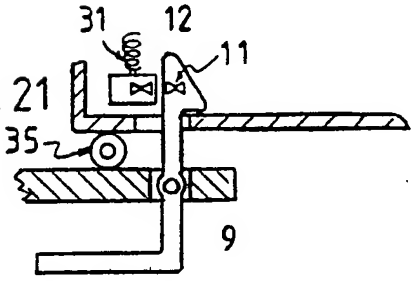
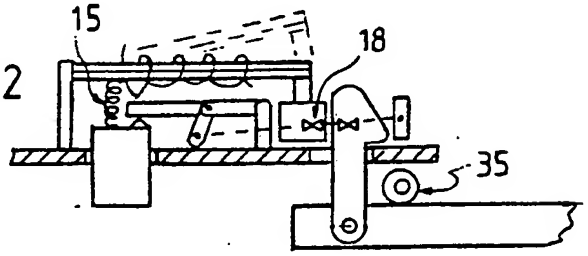


FIG. 22



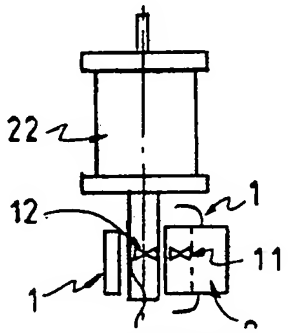
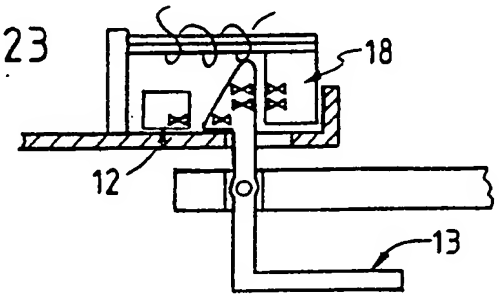


FIG. 23



INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 85/00083

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: E 05 B 17/22

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	E 05 B; E 05 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	DE, A, 2813029 (SIEMENS) 27 September 1979 see page 3, line 9 - page 4, line 14	1,6,7
Y		2-5
	--	
X,P	EP, A, 0113699 (WORMALD) 18 July 1984 see page 4, lines1-18; page 6, lines 6-12	1-3,6-8
	--	
Y	US, A, 3758142 (GARTNER) 11 September 1973 see column 5, lines 32-48; column 7, lines 46-55	2,3
	--	
Y	DE, A, 3202196 (ANETSEDER) 4 August 1983 see page 6, last paragraph	4,5
	------	

* Special categories of cited documents: [10]

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
13th May 1985	13 JUIN 1985
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	G.L.M. Kruydenberg

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 8500083 (SA 8944)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 06/06/85

The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A- 2813029	27/09/79	None		
EP-A- 0113699	18/07/84	AU-A-	2308984	12/07/84
		GB-A-	2133454	25/07/84
US-A- 3758142	11/09/73	None		
DE-A- 3202196	04/08/83	None		

For more details about this annex :
see Official Journal of the European Patent Office, No. 12/82